UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
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Seattle, Washington 98101-3140

JUL 2 4 2012

OFFICE OF THE
REGIONAL ADMINISTRATOR

Forrest Cole, Forest Supervisor
Tongass National Forest
648 Mission Street
Federal Building
Ketchikan, Alaska 99901-6591

Dear Mr. Cole:

The U.S. Environmental Protection Agency has reviewed the Greens Creek Mine Tailings Expansion Draft Environmental Impact Statement. Our review and comments are provided in accordance with our responsibilities under the National Environmental Policy Act (NEPA), the Council of Environmental Quality's NEPA Implementation Regulations at 40 CFR 1500-1508, and our review authority under Section 309 of the Clean Air Act. For the reasons described below, the EPA is rating the Greens Creek Mine Tailings Expansion Draft Environmental Impact Statement (DEIS) "3-Inadequate Information." An explanation of our rating system is enclosed. The EPA would like to discuss these comments with you so that we can develop a path forward that both allows for a more fully-developed, sufficient EIS and ensures a mine plan that will provide adequate protection of public resources. We recommend that this information be provided as a supplement to the draft EIS and circulated for public comment.

Background

On November 14, 2011, the EPA signed a Memorandum of Understanding with the U.S. Forest Service to be a cooperating agency for the Greens Creek Mine Tailings Expansion EIS. The EPA has a particular interest in the water quality issues, especially the need for long-term water quality treatment at the Greens Creek Mine.

The Greens Creek Mine is an active underground metals mine located near Hawk Inlet on northern Admiralty Island on the Tongass National Forest. In addition, portions of the mine facilities are within the Admiralty Island National Monument. Full scale development began in 1987 and because of the operator's continued identification of ore reserves and the need for additional capacity for waste rock and tailings, the Forest Service conducted previous NEPA analyses in 1984, 1988 and 2003. The current EIS evaluates the proposal to expand the tailings facility to accommodate disposal of additional tailings and waste rock based on known and projected reserves for the next thirty to fifty years.

The DEIS analyzes a Proposed Action (Alternative B) to allow up to fifty years of additional capacity for tailings disposal. The proposal includes expanding the existing tailings facility and would result in a loss of 4,046 feet of Tributary Creek (Class I and Class II stream) and 99 acres of jurisdictional wetlands. It would also directly impact an additional 109 acres of the Admiralty Island National Monument. The proposed action's reclamation plan includes an engineered soil cover and synthetic liner system as part of the water management system. The two other alternatives, Alternatives C and D, would minimize impacts to Tributary Creek and the Monument by constructing an additional tailings

facility north of the current facility. This new facility would impact 1,044 feet of Fowler Creek (Class I and Class II) and result in a loss of 114 or 124 acres of wetlands respectively. Under the proposed action and all alternatives, the DEIS identifies the need for water quality treatment in perpetuity.

The EPA provided comments to the Forest Service on the preliminary DEIS on December 9, 2011. We are pleased to note that the DEIS addresses a number of our concerns, clarifying the need for and commitment to long term water treatment and adaptive management. However, the EPA still believes that there is inadequate information regarding financial assurance and environmental analysis. The EPA also has concerns regarding long term environmental impacts to wetlands and Monument values.

Financial Assurance and Environmental Analysis

The EPA commends the Forest Service for acknowledging the need for long term water treatment. We appreciate the information about the process for establishing financial assurance provided in Appendix B, and subsequent discussions about developing financial assurance for long term water quality treatment at Greens Creek Mine that may hold promise. However, funding for long term water management/treatment is not addressed in the DEIS. Therefore, without this information the EPA cannot determine whether water management and source control will be adequate to protect beneficial uses and habitat. Beneficial uses are established for waters within the Greens Creek project area. The most stringent parameters and metals criteria are for the protection of fish propagation and aquatic life. The DEIS states that water quality criteria would be exceeded for both freshwater and marine waters for multiple parameters without active collection and treatment. The DEIS includes a table showing monitoring data for 22 surface water locations over 10 years and lists exceedances of contaminants of concern for each monitoring site. This demonstrates that improved material handling and source control are required and that the current National Pollutants Discharge Elimination System (NPDES) permits for the facility may need additional conditions to protect water quality.

We believe that the full range of potential impacts to aquatic resources should be analyzed in the context of mitigation uncertainty. In addition, we also believe that the modeling predictions used in the analysis are limited and lack sufficient detail to support long term planning. Without knowledge of the model and assumptions, reviewers and the decision maker cannot understand the environmental risks, ensure that adequate mitigation is required, and support selecting an alternative that meets the purpose and need while minimizing impacts.

Recommendations:

- *Provide sufficient detail on the cost of proposed reclamation and long term water treatment. (Please see the attached detailed comments for a list of items that the EPA believes are components of adequate financial assurance).*
- *Include an analysis of environmental impacts to aquatic resources from reasonably foreseeable scenarios.*
- *Provide information on the quality of the geochemical modeling—specifically disclosing the impacts of limited and unknown information on the model predictions and the sensitivity of the model to changes in parameters and assumptions.*

The following discussion is provided to further clarify our concerns regarding financial assurance, analyses of long term impacts, and geochemical modeling.

Financial Assurance

In our review of the 2003 EIS for this project and throughout the development of this DEIS, the EPA has stressed the importance of establishing and disclosing the details of financial assurance for reclamation and long term water management. We believe the Forest Service and State of Alaska agree that financial assurance is important and needed. For example, the State identified the lack of long term bonding as the greatest uncertainty for the mine[1]. However, inadequate financial assurance persists at the Greens Creek Mine. While the DEIS states that financial assurance will be established, the DEIS limits the discussion to the Forest Service and State's process to establish financial assurance and information about the current bond amount of $30,455,000 which does not include long term water treatment.

The EPA appreciates the inclusion of Appendices B and F that outline the process for establishing financial assurance and current bond information. However, the DEIS does not provide an adequate level of detail about the mechanism and cost for long term bonding or proposed reclamation. This information is needed to provide assurance that significant environmental impacts will be avoided or mitigated and that mitigation measures, operation and maintenance, and closure/post closure activities will be adequately bonded if the company fails to meet its requirements. Adequate financial assurance should be required for reclamation and potential long term maintenance of the cover system and long term water management. In order to resolve these issues regarding inadequate information, the EPA recommends that the Forest Service develop and disclose details regarding long term bonding and reclamation of proposed activities as a supplement to the draft EIS, and circulate it for public comment.

Analyses of Long Term Impacts

Without details in the EIS of adequate financial assurance to ensure that mitigation and regulatory requirements will be met to protect resources over the long term, we believe the impact analysis for aquatic resources is inadequate. The EIS needs to analyze the potential of the project to adversely impact beneficial uses of aquatic life and fish propagation and the potential to cause or contribute to water quality standards violations. Watersheds within the Greens Creek project area support anadromous and resident fish, and Hawk Inlet (site of the NPDES discharge point) supports a high value fishery. Through our conversations with the Forest Service, we understand that the assumption underlying the analyses in the DEIS is that there will be full compliance with the mine's NPDES permit in perpetuity. As noted above, there may be a need for more protective conditions in the current NPDES permit to prevent continued and additional water quality impacts. However, the DEIS does not analyze the potential environmental impacts if active water treatment ceases. We acknowledge that full compliance with an appropriately protective permit is a best case scenario; however, we believe that it is not reasonable or realistic to rely solely on this assumption given that the DEIS does not disclose adequate financial assurance to fund mitigation and water management. We note that it is not uncommon for mines to experience unforeseen circumstances as demonstrated at Greens Creek Mine where acid generating material resulted in greater than expected elevated metal concentrations in surface and ground water. Mines may undergo unexpected closures due to factors such as fluctuating metals prices and safety (e.g., Greens Creek closure between 1993 and 1996 due to low metal prices and Hecla's Lucky Friday mine in

[1] ADEC. 2009. *Environmental Audit of the Greens Creek Mine.*

Idaho in 2011 due to safety concerns). The USFS should evaluate reasonable scenarios in order to disclose the potential impacts and to design appropriate alternatives and mitigation. Given that permanent wastewater treatment does not appear to be funded under the current bond for the mine, changes to waste management that would prevent wastewater treatment in the future appear to be the only viable mechanisms to protect water quality.

Geochemical Modeling

The USFS should disclose the probability that predictions are accurate and identify any uncertainties or gaps. The level of confidence in predicted outcomes should be provided so that reasonable decisions about management, monitoring, and mitigation will be made.

Disclosure of the uncertainty and sensitivity analysis is a key component in interpreting predictions. We recommend considering the EPA's guidance[2] (previously provided) as a resource on sufficient level of detail when discussing environmental modeling.

Long Term Impacts to Wetlands

The Greens Creek EIS will be adopted by the Corps of Engineers for their decision to issue a Clean Water Act Section 404 permit. As such, the alternatives analysis must satisfy the Section 404(b) (1) Guidelines. The Guidelines require that waters of the United States be avoided to the maximum extent practicable and that the least environmentally damaging practicable alternative be selected for permitting. The Corps of Engineers released a Public Notice of Application on April 20, 2012, for the discharge of fill material into waters of the United States to facilitate the construction of a dry stack mine tailings disposal site in a southward direction to create a maximum capacity for 15 million cubic yards of additional tailings and waste rock materials.

All alternatives discussed in the DEIS and Public Notice would fill high value wetlands and impact salmon bearing streams. The Proposed Action, Alternative B, would fill portions of Tributary Creek, which would affect stream habitat and Alternatives C and D would fill wetlands that drain into Fowler Creek.

Concurrent, coordinated NEPA processes are encouraged to save time and money. CEQ recommends that to the fullest extent possible, agencies prepare draft EISs concurrently with and integrated with environmental analyses required by other environmental laws and executive orders[3]. We note that this DEIS includes information that the EPA and the Corps of Engineers requested on the functions and values of aquatic resources, but does not include other information relevant to the analysis of wetland impacts and mitigation.

> *The EPA recommends that the 404(b)(1) analysis be completed before publication of the final EIS, giving agencies an opportunity to take a hard look at minimizing long term impacts to wetlands.*

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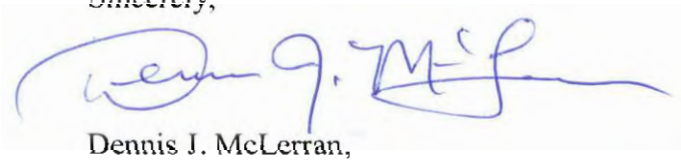
[2] USEPA. 2009. Guidance on the Development, Evaluation, and Applications of Environmental Models. https://ecf.oknd.uscourts.gov/cgi-bin/DisplayPDF.pl?dm_id=852412&dm_seq=17

[3] 40 CFR Sections 1502.25. http://ceq.hss.doe.gov/nepa/regs/ceq/1502.htm

The EPA is committed to continuing our discussions with you to identify mechanisms to resolve the issues indentified in these comments. Thank you for the opportunity to provide comments on this DEIS. Our detailed comments are attached.

Please contact Kate Kelly, Director of the Office of Ecosystems, Tribal and Public Affairs at 206-553-1271 or Christine Reichgott, Manager of the Environmental Review and Sediment Management Unit at 206-553-1601 if you have questions.

Sincerely,



Dennis J. McLerran,
Regional Administrator

cc: US Army Corps of Engineers
Alaska Department of Natural Resources
Alaska Department of Environmental Conservation

Enclosures

EPA's Detailed Comments on Greens Creek Mine DEIS

Financial Assurance

Hardrock mines without appropriate financial assurance can pose significant risks to human health and the environment, and financial risks to responsible parties and the government should clean up become necessary[4]. Appropriate financial assurance ensures that adequate funds will be available to reclaim mines and conduct post-closure management according to approved plans, and thus avoid serious environmental impacts. If information on financial assurance is not disclosed in a NEPA document, decision makers, the EPA, other agencies, and the public are unable to evaluate the potential environmental consequences of proposed mine activities on public lands in a public forum. Because the adequacy of financial assurance is critical to determining the probability of mitigation measure implementation, the estimated amount and adequacy of the financial assurance should be discussed in the EIS transparently and prospectively.

The EPA understands that the Forest Service is currently working with the State to update current reclamation costs and financial assurance at the Greens Creek Mine, as part of the State's five year review cycle. This evaluation includes activities covered in the 2003 EIS but does not include the current, proposed activities. We recommend that the Forest Service consider including the proposed activities and financial information for long term site management in an updated financial assurance package. We note that Appendix B of the DEIS states that financial assurance for proposed actions will need to be developed prior to approving the Plan of Operations. Including the current activities and financial information in the financial assurance update could expedite the approval process.

Our specific comments and recommendations for developing the financial assurance for reclamation and long term water management are provided below.

Review of Appendix B

The Forest Service and State's process is described in Appendix B, which states that the cost estimate and financial assurance will not be finalized until after the modification is approved by the Forest Service. We continue to believe that information about the cost estimate and bonding should be made available during the NEPA process.

Appendix B states that bonding will occur incrementally, in periods not to exceed 10 years. Since water quality treatment will be required at this site in perpetuity, operation and maintenance (O&M) costs will

[4] For example, EPA chose classes of facilities within the hardrock mining industry as the first for which EPA would develop financial responsibility requirements under CERCLA Section 108(b), based upon those facilities' sheer size; the enormous quantities of waste and other materials exposed to the environment; the wide range of hazardous substances released to the environment; the number of active hardrock mining facilities; the extent of environmental contamination; the number of sites in the CERCLA site inventory, government expenditures, projected clean-up costs and corporate structure and bankruptcy potential. Identification of Priority Classes of Facilities for Development of CERCLA Section 108(b) Financial Responsibility Requirements, 74 Fed. Reg. 37,213 (July 28, 2009).

be necessary for potentially hundreds of years. Financial assurance is meant to ensure that there will be funds to complete required reclamation tasks, (as Appendix B states, to serve as "the public's insurance policy that reclamation will be performed,"). We believe there is risk to the federal government if the bond only covers a fraction of that time period. If only 10 years is bonded at a time, and Hecla Mining Company is unable to perform reclamation, the taxpayers may incur this liability.

Appendix B states that the bond review cycle will be 5 years. However, Forest Service guidelines recommend that bonds be reviewed annually for adequacy. Given the volatility of the minerals market, annually ensuring that the financial assurance amount is at least equal to the current cost estimate may prevent a situation where a drop in commodities prices leaves the company in poor financial health and unable to update the instrument. Annual adjustments ensure that the financial assurance amount is close to the cost estimate amount in any given year.

Review of Current Bond

We appreciate the information that the Forest Service shared regarding the current bond for $30,455,000. Our assessment is based on what is disclosed in the EIS. To ensure that the overall financial assurance is protective at Greens Creek Mine, the USFS should provide the following additional information:

Site Reclamation (e.g., facility closure, earth moving/stabilization, revegetation, etc.):

- Estimated cost (+/- percent) to reclaim and close the site in a manner that achieves reclamation goals and post-mining land use objectives.
- Criteria for determining success of reclamation activities for bond release.
- Costs associated with implementing contingency measures to address reasonably foreseeable but not specifically predicted outcomes.

Long-Term Site Management (e.g., post-closure water treatment, mitigation of aquatic resources, site maintenance, and monitoring):

- Itemized cost estimate (including reasonable contingencies) and appropriate economic variables to calculate the net present value of future expenses, including the time period to complete long term treatment, monitoring and maintenance.
- The "mechanics" of the financial assurance mechanism for the site, for example, if a trust is being used, include such details as:
    - Requirements for timing of payments into the trust fund and for "true-ups";
    - Discount rate used, if any, including assumptions for inflation, management fees, and tax rates;
    - Acceptable investment instruments;
    - Tax status of the trust fund and how management fees and taxes are paid; and
    - Identification of the trust fund beneficiaries.

Aquatic Resources

The DEIS states that metals concentrations in fish tissue have been observed in area streams. For example, in Tributary Creek and Greens Creek fish tissue samples have shown an accumulation of metals including cadmium, copper and selenium, a bioaccumulating metalloid. The DEIS does not clearly present the basis for this summarized conclusion. The discussion of baseline conditions related to

mine activities should include a method to identify the source(s) of contaminants and measures to control source(s). The USFS should consider the suite of mitigation measures and the potential impacts to aquatic resources from current and proposed activities.
The DEIS includes Table 2.6-3 listing monitoring requirements and thresholds which would trigger an action. For aquatic resources, the threshold is a significant change as compared to baseline or reference site. The follow up action is to increase the number of parameters analyzed in water samples. We believe that there should also be corrective action required to identify the source(s) causing an impact and intent to control that source or sources.

Wetlands
The DEIS proposes mitigation in the form of repairing a fish pass on Greens Creek, which is considered a temporary mitigation. Flood damage caused the constructed fish pass, used as mitigation previously, to fail and it has not been repaired. Because it is not part of the natural geomorphic form of the stream, the fish pass is not self sustainable and requires maintenance. After mine closure if maintenance ceases and the next flood damage at the fish pass is not repaired, fish will again be eliminated from that stretch of stream. Although the EPA would not typically consider actions that are not self sustaining to be adequate mitigation, if this is determined to meet mitigation requirements, financial assurance should be included to cover the costs of ongoing maintenance.

The Corps of Engineers' Public Notice proposes in-lieu-fees to mitigate for wetland loss. The impacted wetlands are all high value and support salmon streams. A very high ratio would need to be required by the Corps to effectively offset these impacts through in-lieu-fees. The USFS should provide details of how the proposed in-lieu-fee amount and credits for aquatic resource compensation were determined so that their adequacy for mitigation can be determined. In the event that long term water management and mitigation fail, waste rock and tailings facilities sites will produce acid drainage, increasing mobility of metals, allowing them to flow to Hawk Inlet and the respective salmon stream, Tributary Creek and/or Fowler Creek. We believe it is crucial that engineered structures constructed to direct flow in a particular direction function without active maintenance. During the analysis to determine the least environmentally damaging practicable alternative, additional design may be needed to further minimize the risk to surface waters. For example it may be possible to concentrate the placement of additional tailings to minimize impacts. We will be providing comments to the Corps of Engineers per the EPA's shared responsibility to administer and enforce CWA Section 404.

The DEIS states that increased flow to the stream channels may be capable of scouring sediment and impacting the dynamic equilibrium of stream channel morphology. In such a case, habitat values are likely to be lost for an extended distance downstream. If the stream is entrenched as a result, then riverine wetlands would be hydrologically disconnected from the stream, degrading their functional role with the stream (flood water and sediment storage and nutrient export). Erosion of the channel would likely cause sediment deposition in estuarine waters of the delta and marine waters at either Hawk Inlet or Youngs Bay. The DEIS states that monitoring will be required to detect this effect and implement remedial measures. However, once the erosive process starts, damage to stream quality will have occurred. Construction of storm water ponds, proposed as remedial measures, will take time, allowing damage to progress. Once stream morphologic equilibrium has been upset it will likely be reestablished in a different geomorphic and ecological state, responding to the new post erosion conditions. Quality in stream habitat may take a very long time to become reestablished. Therefore, we recommend that the

USFS consider the construction of stormwater detention structures along with the facility rather than post monitoring. If this results in additional wetland impacts, these impacts should be disclosed and mitigated.

Geochemistry

We have several issues regarding different aspects of the geochemical characterization of the site. Specifically these issues are regarding: 1) the temporal representativeness of samples collected from the tailings; 2) the accuracy of the predictive modeling of the tailings water quality; and 3) the visualization of acid-base accounting data.

Sample temporal representativeness The DEIS offers inadequate justification/citation to support the statement that the tailings data shown in Table 3.4-1 represents a ~5 year range of materials (i.e. mid-to-late 1990s). During previous discussions with the agency's EIS technical team the temporal representativeness of this same data has been said to represent an approximately 24 year time frame (i.e. 1988 to present). The large range of estimates of the temporal representativeness of the data (and lack of citation/justification) makes interpretation difficult.

The DEIS presents data from single samples that were "randomly" collected; however it is unclear whether these samples were truly randomly selected or whether these are grab samples collected for another specific study, and therefore not representative of the average conditions of the tailings. It is important that the data is representative of the average conditions of the tailings. The DEIS should rely on summary statistics (e.g. averages, medians) that also include measures of variability (e.g., standard deviations/errors, ranges, etc.) to provide an overall and unbiased understanding of the data that has been collected.

Tailings water quality modeling Overall, there are three main reasons why we believe the modeling performed as part of this DEIS is inadequate: 1) The model has not been subject to the peer-review process and is not publically available or available to the EPA—a cooperating agency on this project; 2) the model was not developed for the purposes of predicting long-term water quality. From Condon, 2011 *"[The model] is intended to be used as a tool to provide a reasonable indication of the characteristics of drainage under anticipated conditions, particularly following closure of the facility. It is not intended to predict exactly the concentration of trace elements or metals hundreds to thousands of years in the future"*; and 3) a sensitivity and uncertainty analysis was not performed on the model.

To support the validity of the geochemical modeling, the DEIS cites similarities between the 2003 final EIS and the current Condon, 2011 modeling results. For example: *The agreement between model results generated on a theoretical basis (2003) and an empirical, field data basis serves to reinforce confidence in the estimates produced by Condon (2011)* (p3-33). However, this is not an entirely accurate description of the 2003 model. For example, from the 2003 EIS it states that: *The model is semi-empirical, meaning that portions of the model mechanistically simulate physical and chemical processes based on basic principles, and other parts of the model rely on empirical measurements...*" Furthermore, the 2003 model was calibrated using empirical wet well data from the tailings. As such, the two models are not entirely independent and the agreement between them should not be used to imply greater confidence than is warranted.

EPA Specific Comments on Greens Creek DEIS

Document Page Number	Line Number	Comment
1-7 and 2-6		On page 1-7 the DEIS states that the tailings disposal facility (TDF) would accommodate an additional 15 million cubic yards of tailings and waste rock. On page 2-6 the DEIS states that the proposed action includes expanding the TDF to a total of 15 million cubic yards. Please correct these discrepancies.
1-14	10	The wording should be to add Chapter 83 to Title 18 not "Title 83"
2-1	¶2	2nd to the last line – "resources" should be "resource"
2-8	3	This part states that there will be room for an additional 1 m yd^3 and that this room would allow for 3 more years of disposal. But Section 2.3.1 says that 180,000 yd^3/yr of tailings are disposed and 54,000 yd^3/yr are co-disposed. 1m yd^3 / (180,000 + 54,000) = 4.3 years
2-12	3	Same comment as above except it is 3 m yd^3 adding 10 more years of disposal but even adding the average waste rock going to Site 23, the math comes out to 12 yrs.
2-12	Footnote 2	Is this necessary since Footnote 1 says the same?
2-16	6	then discharged to Hawk Inlet
2-20	11	The existing mitigation measures listed further seem to apply to both water and wind so should wind be deleted here or should "surface water diversions" be deleted from line 13?
2-23	Section 2.4.8 ¶2	It is not clear how surface water diversions prevent wind erosion
2-28	Section 2.5.2	The language about submarine tailings disposal from the previous page is repeated here.
3-21	Last ¶	Please clarify how the Nevada Division of Water Resources safety factors are applicable in SE Alaska given the differential rainfall and the potentially related differential in pore water pressure conditions.
3-24	Table 3.4-1	Several issues: 1) There are extra periods in the data (e.g. 3.8.3 %); 2) Barite should be 12.0 instead of 12.3; 3) the chemical formula for chlorite the "5" should be subscripted; and 4) n=12 should be added to the Table title.
-24		The averages are based on 12 samples not 14 samples.
3-24		Waterloo (2011) is not listed in the references.
3-25		Regarding: "Data presented in the figure span ages from 1994 to 2008 and provide a representation of the variability of the acid-base balance in Greens Creek tailings." It should be clear what the dates represent—are these the dates the samples were collected or the dates the ABA analysis was completed? It's not entirely clear, but it appears that the data referred to as "2008 data" may have been collected in 2005 and stored in the freezer

		for 3 years before it was analyzed. If this is the case, the Figure and text should be changed to say 2005 data instead of "current study" or "2008".
3-25		Regarding: "The dashed box in (b) corresponds to the range of data in (a) for the years 1994-2004." This information should be placed in the Figure 3.4-1caption and not in the main body of the text.
3-27	Table 3.4-3	For Hg there is a footnote 14 that doesn't seem to refer to anything.
3-27		The statement that the grain size of the tails remains essentially constant would only be accurate if there were no co-disposal occurring, since the waste rock material in the tailings would result in the tailings having very heterogeneous grain sizes (as mentioned on p 3-25). Other statements on p 3-29 also make reference to the tailings being fine-grained and how this would restrict infiltration; however, the impacts on infiltration during co-disposal scenarios due to the large grain size of the waste rock is not discussed.
3-28		Regarding "Laboratory rate equations have also been established for oxidation of pyrite at the Greens Creek Mine site (Williamson and Rimstidt 1994)." A reasonable interpretation of this sentence implies that Williamson and Rimstidt, 1994 performed a laboratory study on Greens Creek tailings materials to determine the pyrite oxidation rates. However, the rate law presented in Williamson and Rimstidt, 1994 is not based on Greens Creek samples but instead was performed on pyrite that was obtained from Peru. Presumably, the pyrite oxidation rate of 200 mg/kg/week presented in the DEIS was calculated using the rate law established in Williamson and Rimstidt, 1994 by using Greens Creek site specific data. The way the sentence is currently worded and cited may be misleading. Suggested change "Using the general rate law for pyrite destruction established by Williamson and Rimstidt, 1994, Greens Creek site specific data was used to predict…."
3-29		Text describes the development of ARD in seeps associated with tailings "where unlimited water and oxygen were available." It is clear that a distinction is being made between those areas and the current and future TDF based on their exposure to oxygen, but it isn't clear what those areas were other than that they were "associated with tailings." Describe their locations and other characteristics and explain how their setting is different from those that will be found in the future.
3-33		Regarding: "In other words, the inherent error of the points associated with each model line overlaps every other line." The graphs do not show any measure of the error associated with the

		lines. If uncertainty and sensitivity analysis were not performed on the model how was the level of error determined?
3-33		Regarding: "Overall, the modeled estimates for future water quality discharging from the tailings impoundment is very similar to the estimates made in 2003." The term "very similar" is vague and a more quantitative statement is preferable. In doing our own comparison of the 2003 and 2011 models, for most parameters the predictions between the two are within the same order of magnitude, though 2 to 7-fold differences are common. For some elements (such as Selenium and Cadmium) the difference in the two model's predictions means the differences between meeting and exceeding Alaska Chronic Fresh WQS. As such, stating that the model results were within the same order of magnitude is more accurate than stating that they were "very similar".
3-76		"The groundwater monitoring system will be used..." Doesn't the expansion require a new ground water monitoring system? Explain when that system is designed, where it will be fully described and whether it will be available for public review.
Section 3.4.2		Clarify the locations of the seeps discussed here-- are they within the TSF, in nearby areas with drainage controlled and directed to treatment, or in uncontrolled areas?
Section 3.4.4, p 3-34	Figure 3.4	The summary should list the parameters that are expected to exceed WQS. *Acid-base accounting* We believe the geochemistry data presented in Figure 3.4- contains inaccurate and incomplete information. For example: • In graph (a) the "boxes" labeled 2002-2004 should be labeled 1994; and presumably the "triangle" data labeled 1994 should be changed to 2002-2004. • The DEIS text refers to the "circle" data as "raw data"; however on graph (a) it is referred to as "Current study" and on graph (b) it is referred to as "Reported". Using consistent terminology between graphs and the text will increase the clarity of the information presented. • Showing the raw data twice on graph (a) and (b) does not make sense as the raw data should not be used for temporal comparisons—instead the corrected/calculated values are a better comparison. If the "calculated" values were added to graph (a) instead of the "reported" values this would then negate the need to the "dashed box" in graph (b). This would result in a stronger visual representation of the data. To demonstrate that there has not been any systematic change in the acid-base ratios over time, the EIS should present all of the years' data on a single graph. As such, data that was collected

		from 1990 and 1999 (as presented in the 2003 EIS) should be added to this figure.
3-77	¶ before 3.6.3.5	"would" should be "could" (this was changed in an earlier reference (pg 76 ¶ before Mitigated B) but not here or the next one)
3-78	¶ 3	"would" should be "could" (see above)
3-93	1 – 13	Earlier in the document, there was a statement about the inlet fully flushing every 5 tidal cycles. Does this have any impact on what is presented in this section?
3-135	1st line after Table	"were" should be "are"
3-136	Tables 3.10-4,6,7,8	For each of these tables except 10-6, the numbers in the columns add up to the Total shown. Each has a note below stating that a certain amount of acreage is included but that amount is only added in to the total in Table 3.10-6. Why is it added here and not in the other Tables?
	Table 3.4.1	The percent by weight column has extra decimals. The paragraph above the table describes the number of samples and the multiple depths, but needs to clarify the number of separate locations sampled as well.
Section 3.22		The cumulative effects of activities potentially impacting water resources at the mine need to be considered. For example, we understand that waste rock storage facility, Site 23, was constructed on a historic landslide event in uplands directly above Greens Creek and has been incrementally shifting. The EIS should disclose site conditions such as this that may impact water resources in the future should be disclosed.

U.S. Environmental Protection Agency Rating System for Draft Environmental Impact Statements Definitions and Follow-Up Action*

Environmental Impact of the Action

LO – Lack of Objections

The U.S. Environmental Protection Agency (EPA) review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC – Environmental Concerns

EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce these impacts.

EO – Environmental Objections

EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU – Environmentally Unsatisfactory

EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1 – Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2 – Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses or discussion should be included in the final EIS.

Category 3 – Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the National Environmental Policy Act and or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

* From EPA Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment. February, 1987.